Architecture Development

29 September 2003

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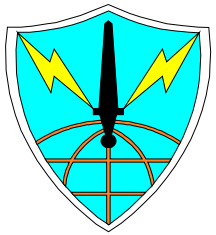
Topics

- Enterprise Architecture in General
- Systems Architecting
- AMC ISA Methodology and Lessons Learned

Presentation Goals

- Present common definitions and terms
- Provide information that although general in nature will allow you to pinpoint those areas you want more detail on.
- Present some experiential info on previous architecture effort



“ Our information technologies and our knowledge economy give us the opportunity to do things we never dreamed possible 50 years ago. But to seize this opportunity, we must pick up the wreckage of our industrial era institutions and rebuild.”

David Osborne and Ted Gaebler, Reinventing Government
(New York: Addison-Wesley Publishing Company, Inc., 1992)

WHAT IS AN ENTERPRISE?

1

2

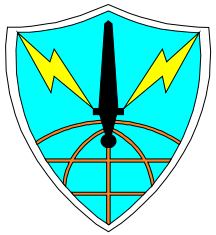
3

4

http://www.geocities.com/Area51/Nebula/1424/entrpris/ov101img.html
http://www.geocities.com/Area51/Corridor/5792/
http://www.cv6.org/noumea/default.asp?uri=browse/date/1942

Enterprise Definitions

- **Enterprise:** the highest level in an organization; it includes all missions, tasks, and activities or functions; usually used in the cumulative sense, meaning enterprise-wide in scale.
- **Enterprise Architecture**:
  - Closes the gap between business and IT
  - Puts the business vision and strategy first
  - Sets the future direction
  - Is both a process and a product
  - Is not just about technology



Enterprise Architecture in the Government

IT'S THE LAW

Executive Order 13011, 16 JUL 96, Federal Information Technology

It shall be the policy of the United States Government that executive agencies shall:

(a) significantly improve the management of their information systems, including the acquisition of information technology, by implementing the relevant provisions of the Paperwork Reduction Act of 1995 (Public Law 104-13), the Information Technology Reform Act of 1996 (Division E of Public Law 104-106) ("Information Technology Act"), and the Government Performance and Results Act of 1993 (Public Law 103-62)…

(b) Refocus information technology management to support directly their strategic missions…

(c) Establish clear accountability for information resources management activities…

…

Note: This order established the Federal CIO Council

Guidance

- Government Performance Results Act of 1993

  To provide for the establishment of strategic planning and performance measurement in the Federal Government, and for other purposes.

- Paperwork Reduction Act of 1995
  - Established the Office of Information and Regulatory Affairs

    Develop, coordinate and oversee the implementation of Federal information resources management policies, principles, standards, and guidelines

- Clinger-Cohen Act of 1996 (Information Technology Reform Act)
  - Established Agency CIOs
  - Requires an Information Technology Architecture

  "An integrated framework for evolving or maintaining existing information technology and acquiring new information technology to achieve the agency's strategic goals and information management goals"

More Guidance

- OMB Circular A-130: Management of Federal Information Resources 6 FEB 96

  Provides uniform government wide information resources management

  policies as required by the Paperwork Reduction Act

- OMB Memo M-96-20 Implementation of the Information Technology Management Reform Act , 4 APR 96

  Provides preliminary guidance to Federal Agencies on the implementation of the Information Technology Reform Act – OMB Circulars will provide further guidance.

  Requires CIO to report directly to Agency Head

And More Guidance

- OMB Memo M-97-16 Information Technology Architectures 18 JUN 97 with attachment “Development, Maintenance, and Implementation of Agency Information Technology Architectures”
  - Guidance to Federal Agencies on the development and implementation of Information Technology Architectures

Yet Even More Guidance

- Army Regulation 25-1 Army Information Management effective 15 MAR 2000
  - Established the policies and assigned responsibilities for the management of information resources and information technology
  - Implemented the ITMRA, the Paperwork Reduction Act, and DoD Directives
  - Established DISC4 (Army CIO/G6) as the CIO for the Army and made the CIO responsible to “develop and implement Army-wide IT architecture”

Additional Guidance (for those so inclined)

- OMB Memo to Executive Departments and Agencies – Funding Information Systems Investments - 25 OCT 96
- GAO/AIMD-94-115 Report: Improving Mission Performance Through Strategic Information Management and Technology- (Date ?)
- National Institute of Standards and Technology (NIST) Special Publication 500-167, “Information Management Directions: The Integration Challenge.”
- A Practical Guide to Federal Enterprise Architecture, Chief Information Officer Council, Version 1.0, FEB 2001

Information Technology Architectures

- Describes the relationships among the work the agency does, the information the agency uses, and the information technology the agency needs. It includes standards that guide the design of new systems.
- CIOs are responsible for the architecture
- The architecture must integrate the business processes and goals of the agency with IT acquisitions
- The architecture focuses on work processes, information flows, and standards

Information Technology Architectures

The ITA will contain two elements:

- The Enterprise Architecture
  - The explicit description of the current and desired relationships among business and management processes and information technology.

- A Technical Reference Model and Standards Profiles
  - The TRM identifies and describes the information services.
  - The Standards Profile defines a set of IT standards that supports the TRM services

Information Technology Architectures

The EA part of the ITA has five components:

1. Business Processes
2. Information Flows and Relationships
3. Applications
4. Data Descriptions
5. Technology Infrastructure

Federal CIO Council Definitions

Enterprise Architecture – a strategic information asset base, which defines the mission, the information necessary to perform the mission, the technologies necessary to perform the mission, and the transitional processes for implementing new technologies in response to the changing mission needs. An enterprise architecture includes a baseline architecture, target architecture, and a sequencing plan.

The Federal Enterprise Architecture consists of multi-organizational functional segments of the Federal Government.

Federal CIO Council Definitions

- **Architecture** – the structure of components, their interrelationships, and the principles and guidelines governing their design and evolution over time.

- **Enterprise** – an organization (or cross-organizational entity) supporting a defined business scope and mission. An enterprise includes interdependent resources (people, organizations, and technology) who must coordinate their functions and share information in support of a common mission (or set of related missions).

AEAMP Definitions

- The Army Enterprise is the entire Army—major commands, headquarters, agencies, installations, and Army forces—and the activities that those organizations perform. The Army Enterprise represents the Army as a corporate entity and prescribes a new way of accomplishing the Army's missions by taking full advantage of IT, using innovative business practices, and synchronizing Army IT resource management activities toward common goals.
- The Army Enterprise extends beyond the Army and includes relationships with external organizations and activities. For example, the Army Enterprise includes the relationships among Army forces, a superior joint command, and other Service forces assigned to the joint command. The Army Enterprise also includes the relationships between the Army and other government organizations and activities, and between the Army and non-government organizations and activities.

AEAGD Definitions

Architecture – *the structure of components, their interrelationships, and the principles and guidelines governing their design and evolution over time.* An architecture can be concrete and tangible or abstract and intangible and can be placed in a temporal context from the present time to various future states

Italics show the C4ISR Framework Definition

Army Enterprise Architecture

- The Army Enterprise Architecture was intended to:
  - fulfill the 1996 Clinger-Cohen Act requirement to develop an enterprise-wide information technology (IT) architecture.
  - Be the Army-wide IT architecture that describes the relationships among key Army institutional processes and IT to ensure the alignment of information systems acquisition and related processes with validated warfighting operational and support requirements.
  - To ensure adequate Army, joint, and combined interoperability; redundancy and security of information systems; and the application and maintenance of a set of standards (including technical standards) by which the Army evaluates and acquires new systems.
- The AEA was intended to be both a tool and a set of products.
  - The AEA is a tool to describe the Army's IT requirements and capabilities.
  - As a set of products, the AEA is the validated description of the Army's IT requirements, existing capabilities, projected needs, and prescribed IT standards based on a consistent methodology.

JTA-Army

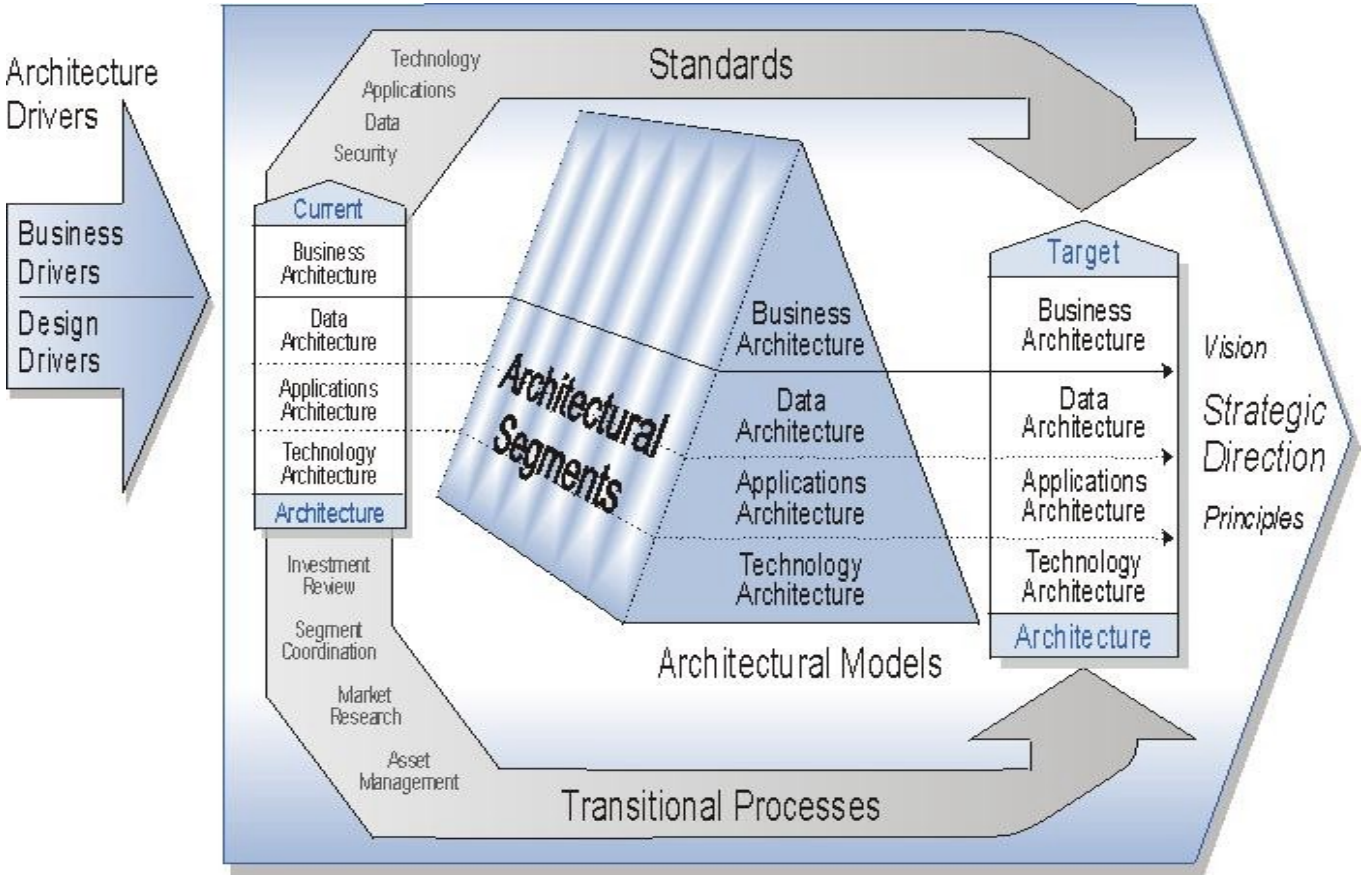
In conjunction with the TAFIM TRM meets the ITA requirement for Technical Profile and Reference Model

Enterprise Architecture Frameworks

Frameworks include concepts that drive the types of architecture products being created. The products, both graphical and textual, capture the information prescribed by the framework.

From the Federal Enterprise Architecture Framework, Version 1.1 published by the Federal CIO Council in SEP 1999

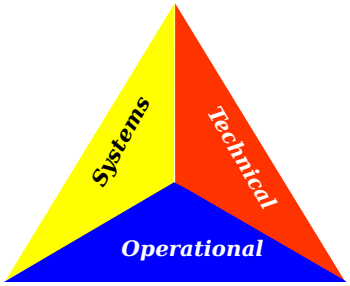
Federal Enterprise Architecture Framework (FEAF)

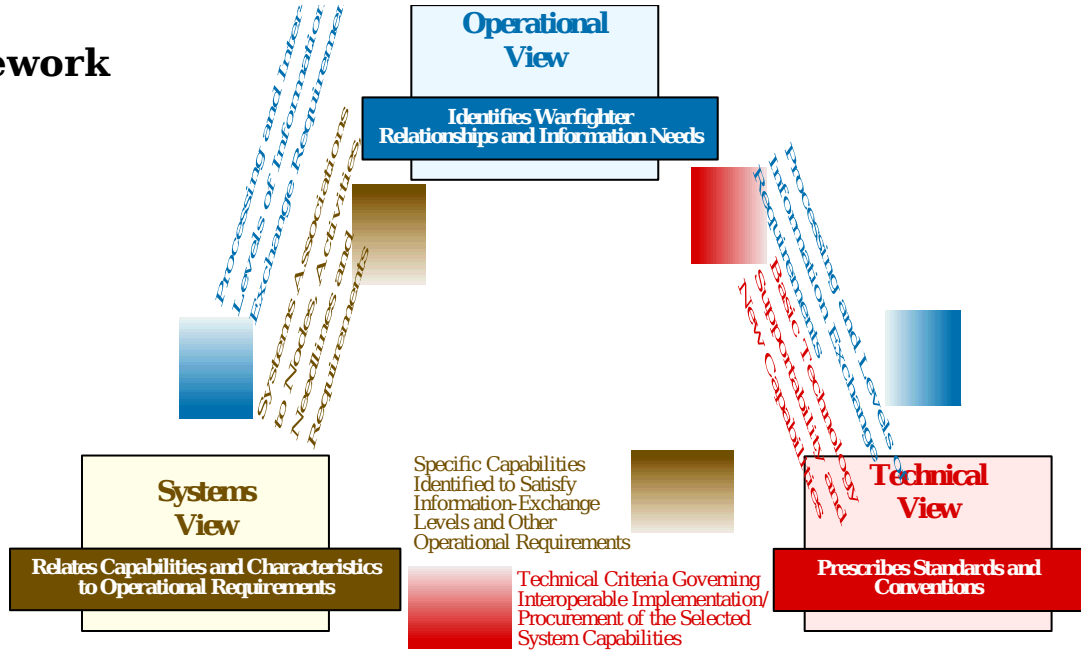


C4ISR Architecture Framework

C4ISR
Architecture Working Group (AWG)

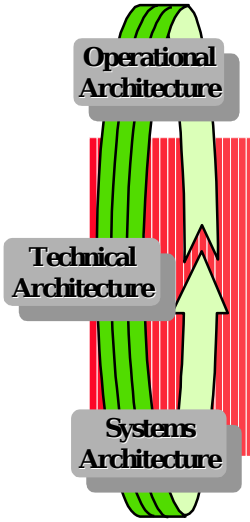
C4ISR Architecture Framework Version 2.0




Operational View
Identifies Warfighter Relationships and Information Needs
Processing and Inter-Levels of Information Exchange Requirements
Systems Associations to Nodes, Activities and Needlines and Requirements
Processing and Levels of Information Exchange Requirements
Systems View
Relates Capabilities and Characteristics to Operational Requirements
Specific Capabilities Identified to Satisfy Information-Exchange Levels and Other Operational Requirements
Technical Criteria Governing Interoperable Implementation/ Procurement of the Selected System Capabilities
Technical View
Prescribes Standards and Conventions

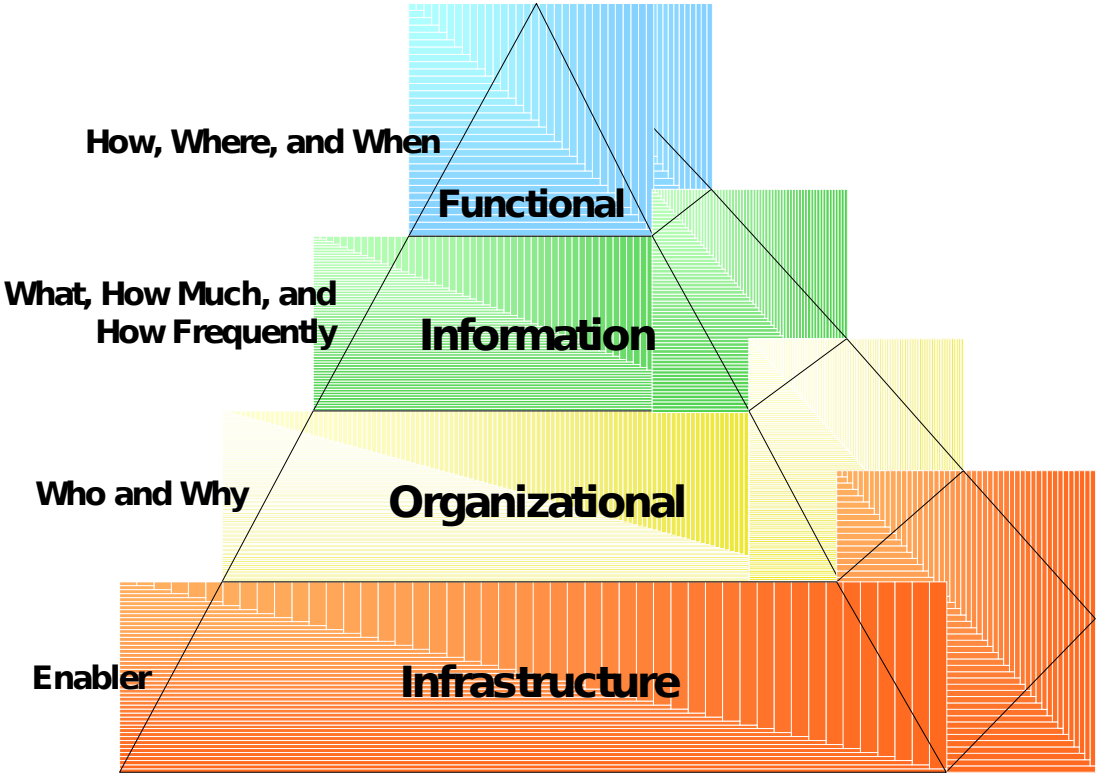
18 December 1997

AEAGD



- *Operational Architecture (OA)* is the total aggregation of missions, functions, tasks, information requirements, and business rules
- *Technical Architecture* is the "building codes" upon which systems are based
- *Systems Architecture* is the physical implementation of the OA, the layout and relationship of systems and communications

The Treasury Enterprise Architecture Framework



Zachman's Framework

	Data	Function	Network	People	Time	Motivation
Planner's View	List of Things Important to Business Entity=Class of Business Thing	List of Processes the Business Performs Function=Class of Business Process	List of Locations Important to Business Node=Major Business Location	List of Organizations Important to Business Agent=Major Org Unit	List of Events Significant to Business Time=Major Business Event	List of Business Goals/Strategies End/Means=Major Business Goal/CSF
Owner's View	e.g., Entity Relationship Diagram Ent=Business Entity Rel=Business Rule	e.g., Function Flow Diagram Function=Business Process	e.g., Logistics Network Node=Business Location Link=Business Linkage	e.g., Organization Chart Agent=Org Unit Work=Work Product	e.g., Master Schedule Time= Business Event Cycle=Business Cycle	e.g., Business Plan End=Business Objectives Means=Business Strategy
Designer's View	e.g., Data Model Entity=Data Entity Relationship= Data Relationship	e.g., Data Flow Diagram Funct=Appl Function Arg=User Views	e.g., Distributed System Architecture Node=Info Sys Funct Link=Line Char	e.g., Human Interface Architecture Agent=Role Work=Deliverable	e.g., Processing Structure Time=System Event Cycle=Processing Cycle	e.g., Knowledge Architecture End=Criterion Means=Option
Builder's View	e.g., Data Design Entity=Segment/Row Relationship=Pointer/Key	e.g., Structure Chart Funct=Computer Funct Arg=Screen/Device Formats	e.g., System Architecture Node=Hardware/System Software Link=Line Specification	e.g., Human/Technology Interface Agent=User Work=Job	e.g., Control Structure Time=Execute Cycle=Component Cycle	e.g., Knowledge Design End=Condition Means=Action
Subcontractor's View	e.g., Data Definition Description Ent=Fields Rel=Addresses	e.g., Program Funct=Language Stmts Arg=Control Blocks	e.g., Network Architecture Node=Addresses Link=Protocols	e.g., Security Architecture Agent=Identity Work=Transaction	e.g., Timing Definition Time=Interrupt Cycle=Machine Cycle	e.g., Knowledge Definition End=Subcondition Means=Step

System Architecture

- The “system architecture” is the structure of the system
- The “overall architecture” includes the structure not only of the system, but of its functions, the environment within which it will live, and the process by which it will be built and operated.

The systems architect is concerned with the overall architecture, not just the system architecture.

(Info from REF 1)

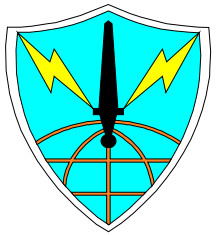
Definitions

System: a set of different elements so connected or related as to perform a unique function not performable by the elements alone. (Ref 2)

Systems Architecting: the art and science of designing and building systems. (Ref 2)

Systems Engineering: Applying engineering efforts to customer needs and transforming them into a description of product performance and physical realization. (Ref 6)

The science of designing and building systems. (Citera)



Architecture and Design

Jim Sinur of Gartner Group Inc. provided this insight at the June 1996 ZIFA Annual Forum. (ZIFA stands for Zachman Institute for Framework Advancement.) He said that if you **can implement a drawing in more than one way, you have architecture**. If you can **implement a drawing in only one way, then the drawing contains exact specifications** for instantiation, and you have **design**.

Systems Architecting Underpinning

- The elements are **complex**- probably systems in their own contexts

- The system is **unprecedented** (extra-ordinary)

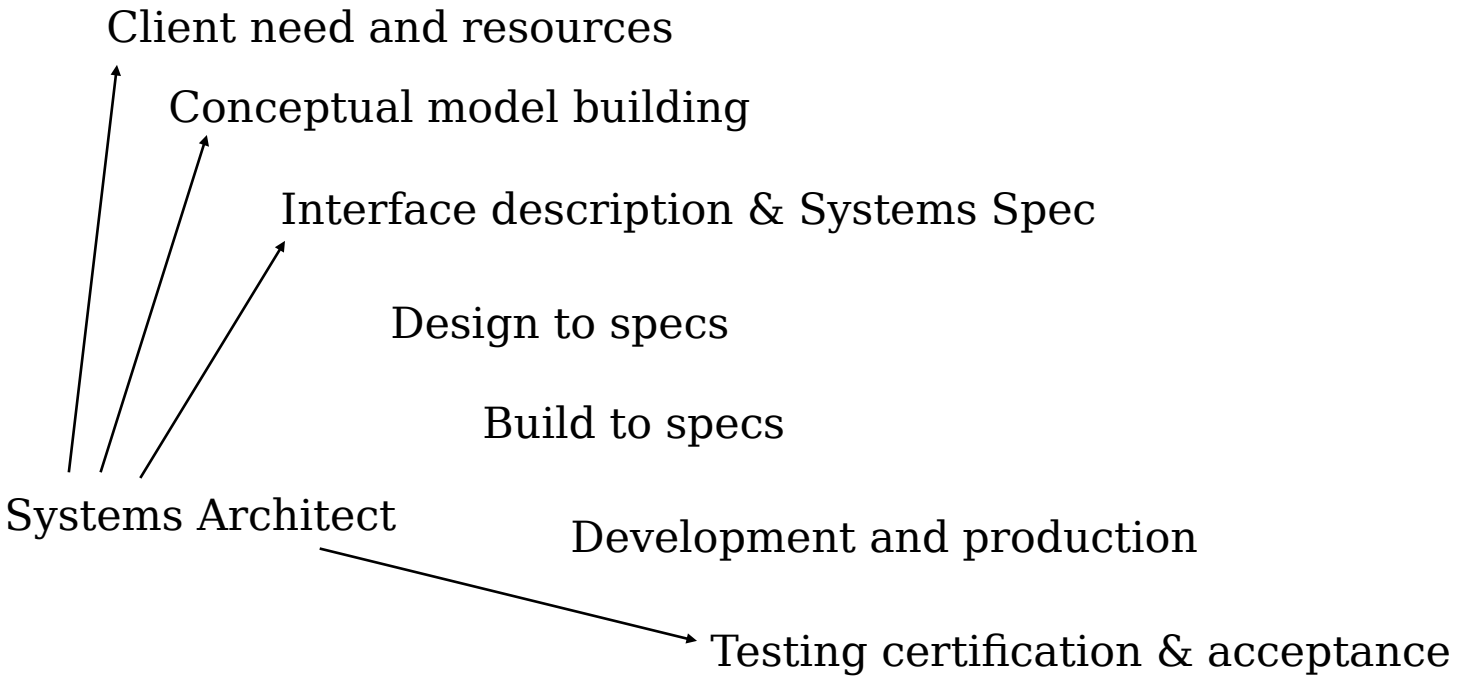
- There is a **client** (customer)

The Architect and the Engineer

- Architecting is working *for* a client and *with* a builder
- Engineering is working *with* an architect and *for* a builder

- The **Architect** focuses on **function** and tends to concentrate on concepts, synthesis, top-level specifications, non-technical as well as technical interfaces and mission success. Also- only the interfaces that most affect the functioning of the system as a whole.
- The **Engineer** focuses on **form** and tends to concentrate on defined subsystem interfaces, analysis, and performance to specification. Responsible for integrating and managing all interfaces before the job is complete.

Role in Systems Engineering Process



Integration

The Systems Engineer performs three integration tasks during the systems engineering process:

1. Requirements integration
2. Integration of specialty engineering functions
3. Integration of subsystems and components

If systems engineering is done correctly, external interfaces at the system boundary are accounted for in the design. I.e., a system to be implemented on an installation ought to have few integration issues.

However, integration of disparate systems seems to be a growing business in the Army. And post deployment integration is significant.

Systems Architecting

- Purely analytical techniques while necessary at the lower levels are overwhelming at the higher levels of a complex system
- The basic technique is to concentrate on the essentials and reduce the solution space using qualitative methods.
- Many minor issues will be resolved by major solutions to issues.
- Reduce complexity, bring order out of chaos.

Architecting Methodologies

- Normative (Pronouncement) {As it ‘should be’}
  - Based on the respected value judgments of prominent engineers
  - Rule-based (building codes and standards)
  - Specifies the end solution
- Rational (Procedural) {The heart of systems engineering}
  - Focuses on the procedures by which solutions can be found
  - System analysis, Mathematical methods etc.
  - Specifies the steps to solving a problem
- Participative (Argumentative) {Objective is consensus}
  - Brainstorming
  - stakeholder based
  - Least used technique
- Heuristic (Contextual Sense) {Common Sense in a context}
  - Insights based on experience
  - Inductive as opposed to deductive reasoning

Architecture Representations

- Business Process Model
- Data Model
- Application Model
- Technology (Networking/Comms) Model

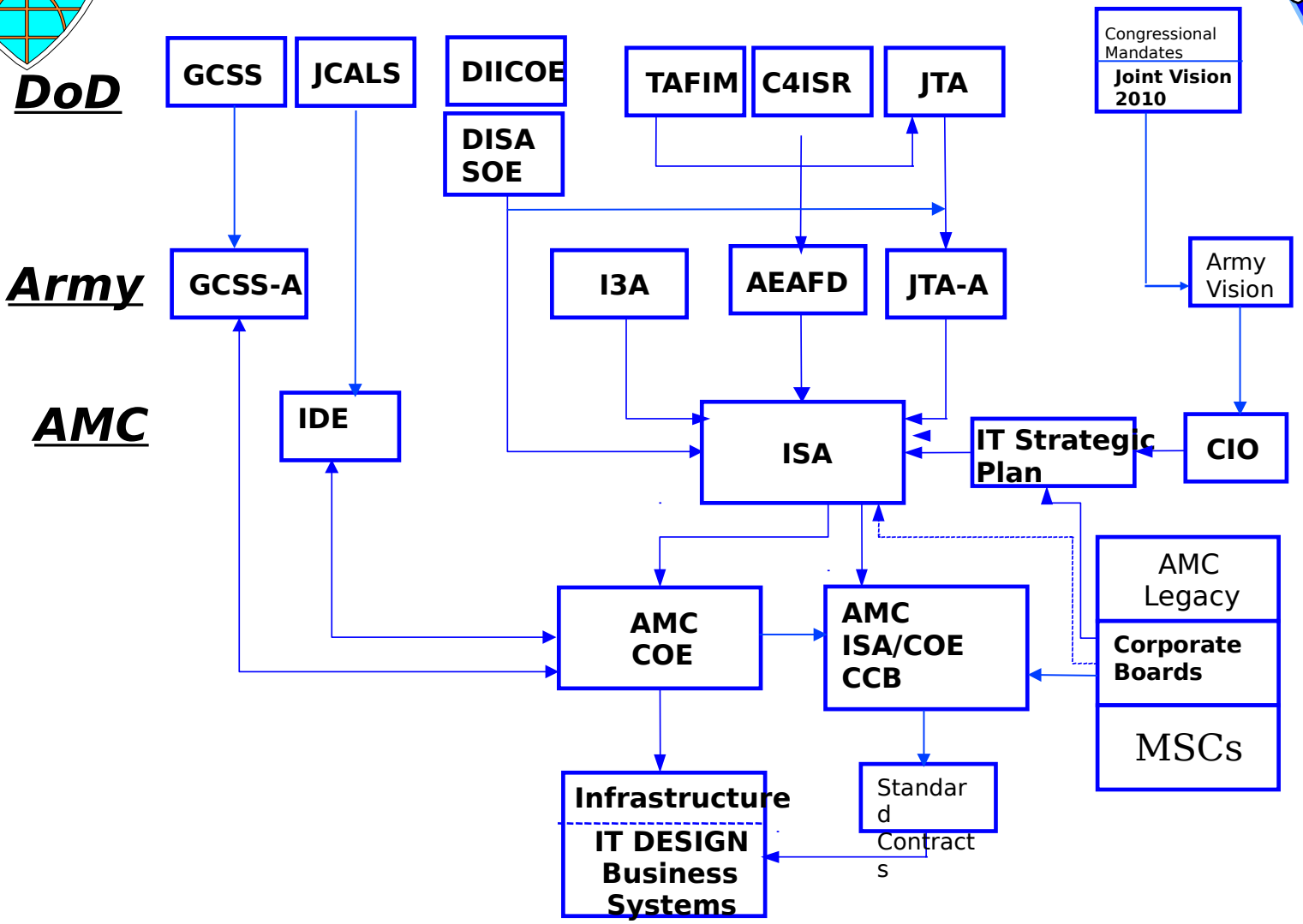
- Architecture models should be built to answer the specific questions of the project.
- From the models you should be able to generate the required C4ISR (DOD) AF views.

AMC INFORMATION SYSTEMS ARCHITECTURE Methodology and Lessons Learned

AMC ISA Approach

- High level conceptual guidance
- Not a specific system design
- If a solution already exists - USE IT
  - Subject Matter Experts
  - Practitioners
  - Best Industry Practices/Trends/Case Studies
  - Industry Leaders
  - Standards (JTA-A, DII COE)
  - Stable technology as solutions
- Reserve time-consuming detailed analysis for specific/important concerns
- Baseline assessment of current AMC infrastructure focused on DOIMs
- C4ISR Architecture Framework, Army Enterprise Architecture Guidance Document

INFLUENCES ON THE AMC ISA



Six Step Architecture Description Process

1. Determine the intended use of the architecture
2. Determine scope of the architecture
3. Determine characteristics to be captured
4. Determine views and products to be built
5. Build the requisite products
6. Use architecture for intended purpose

Step 1 (INTENDED USE)

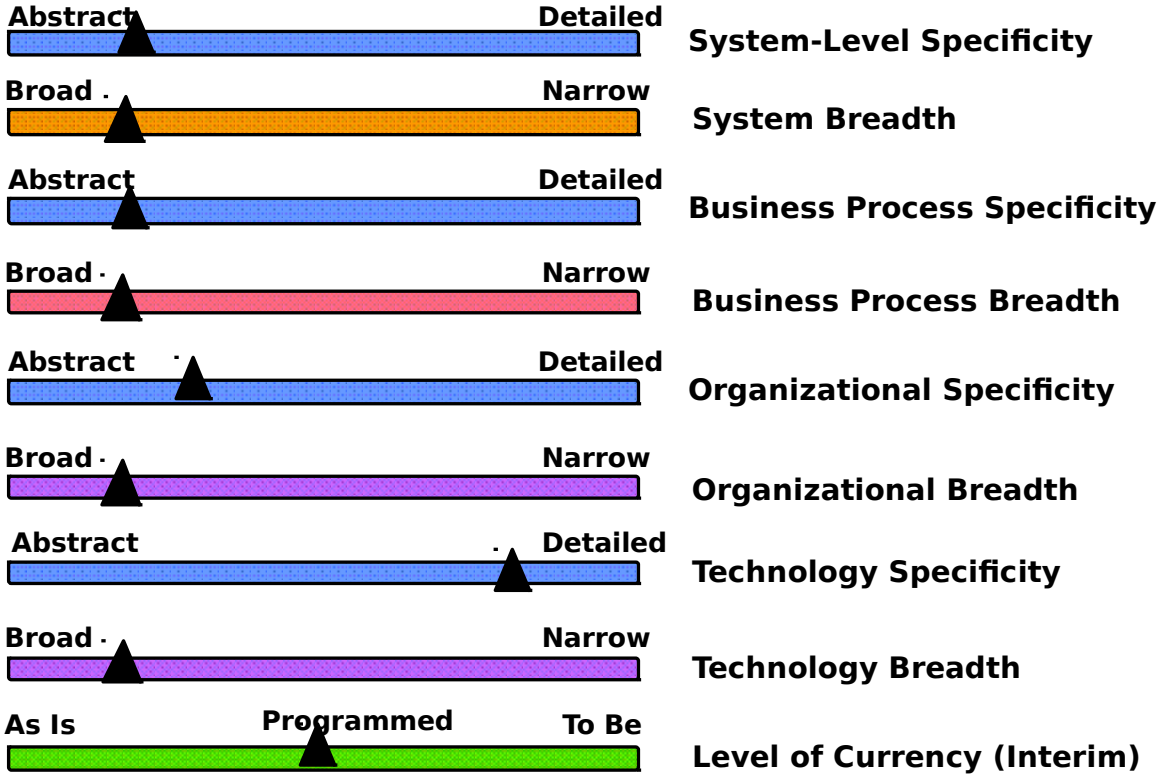
Provide a mechanism for Understanding and Managing Complexity

- Ensure AMC Infrastructure is in compliance w/DA, DOD standards
- Ensure economies of scale (Cost effectiveness)
- Provide framework for modernization, synchronization & integration
- Provide basis for migration plans
- Drive out Policy
- Improve access to data/information

Step 2 (SCOPE)

- Physical Boundaries
  - All AMC Installations
  - AMC Organizations on other installations
  - Tenants on AMC installations
- Activity Boundaries
  - Peacetime
  - wartime
  - OOTW
- System Boundaries
  - Business systems
  - Office systems
  - Interfaces to unique R&D systems (Labs etc.)

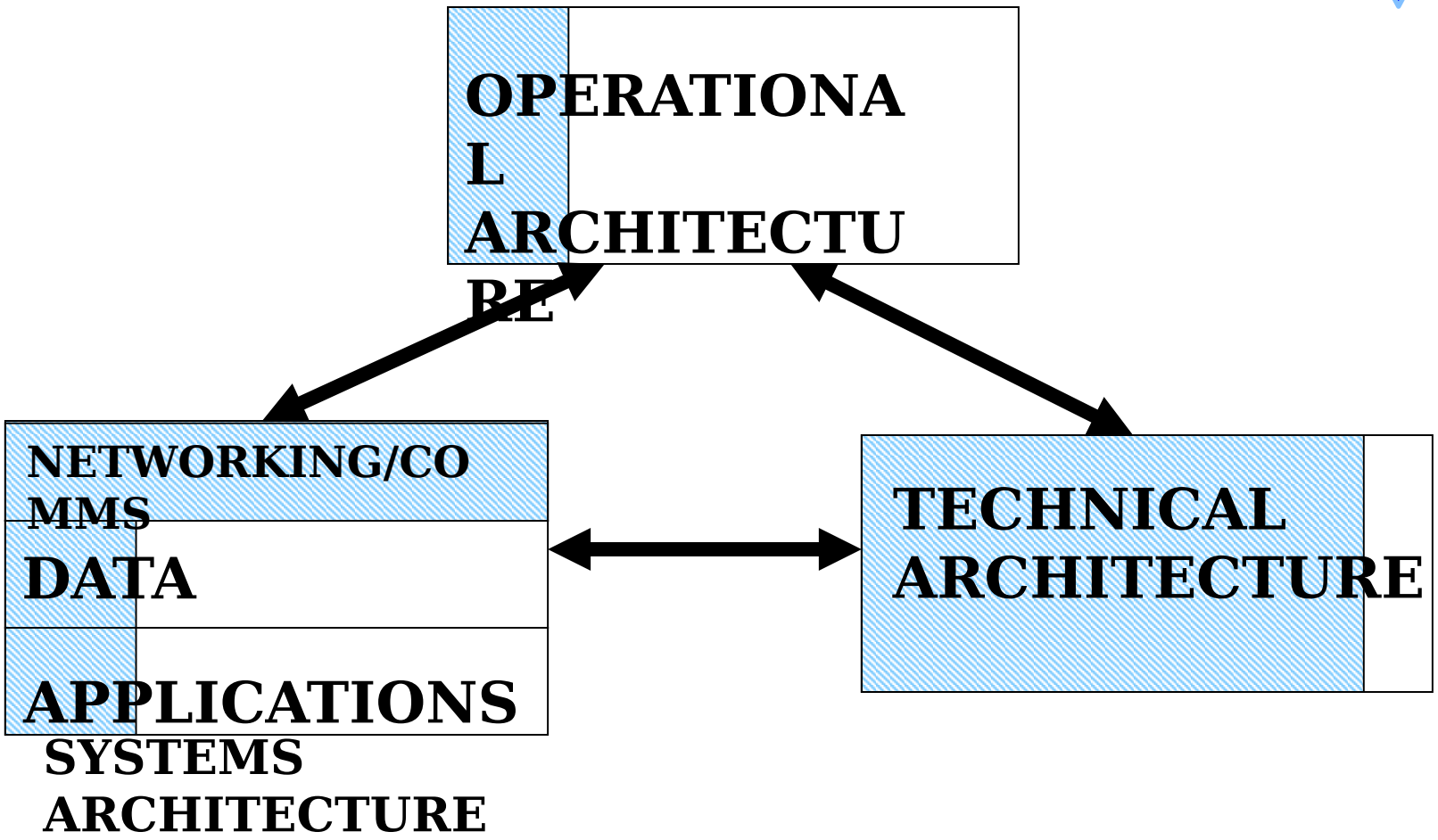
SCOPING DIMENSIONS



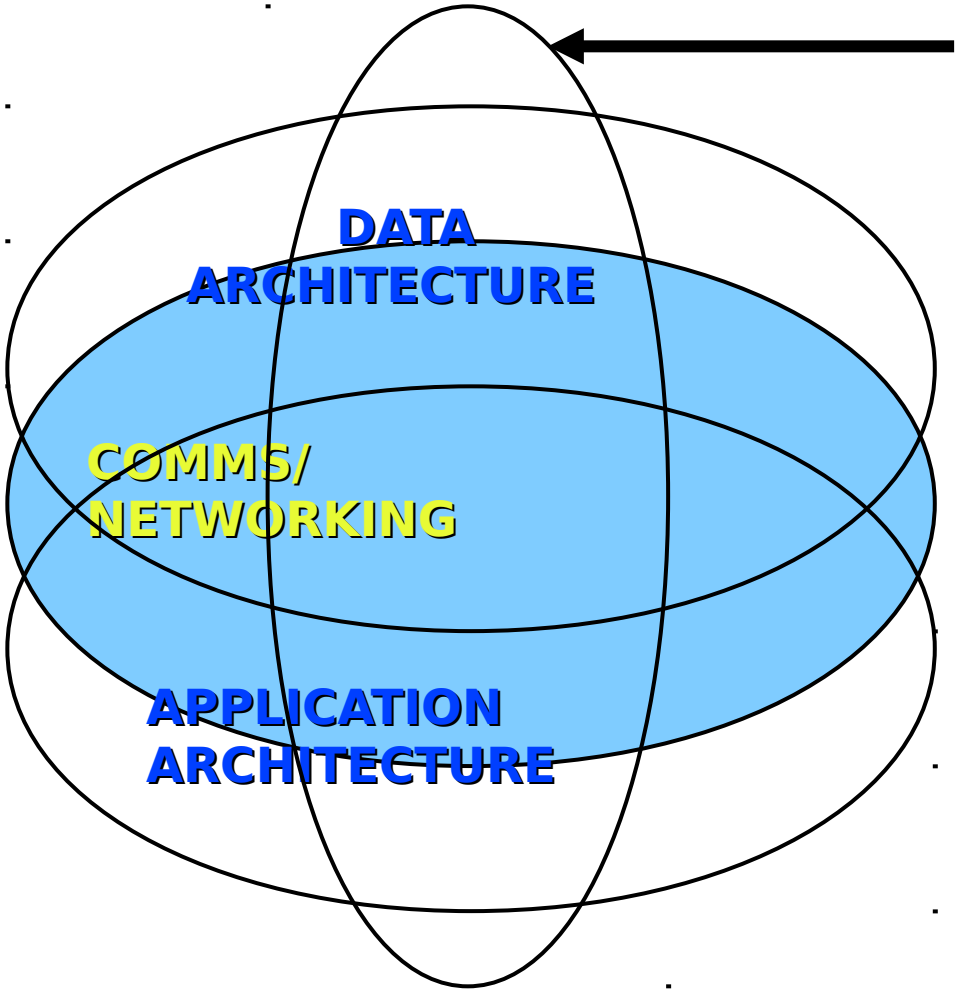
Step 3 (CHARACTERISTICS)

- Centralized vs. Decentralized
- Security built in at all levels
- Change Ready (Tech Insertion)
- Web Centric
- Standards Based
- Enabling Technologies
- Embedded policy
- Universal access to data
- Enterprise management capability
- C4ISR Architecture Framework
- Eight Service Areas
- Graphics Presentation Format

Characteristics



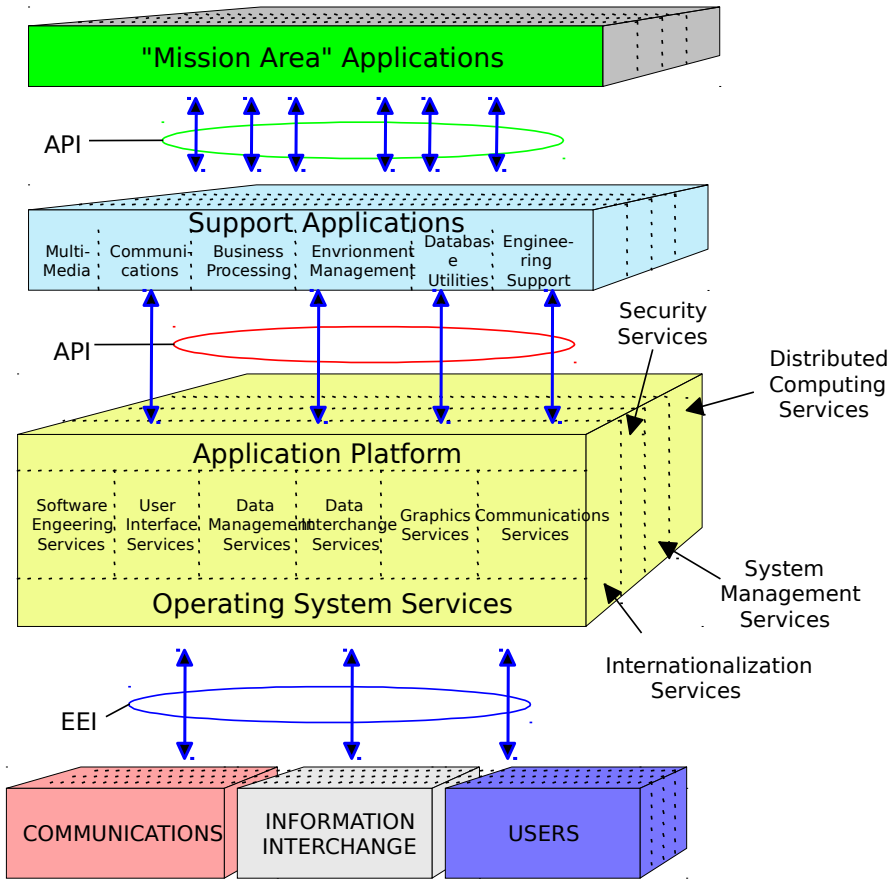
Characteristics



Characteristics

TRM and AMC Service Areas

TAFIM TRM Version 2.0



AMC-ISA

Application Services

EC: EC/EDI

DM: Data Management

User Services

AD: Application Development

CT: Collaboration Tools

NW: Communications & Networking

SS: System Servers

System Services

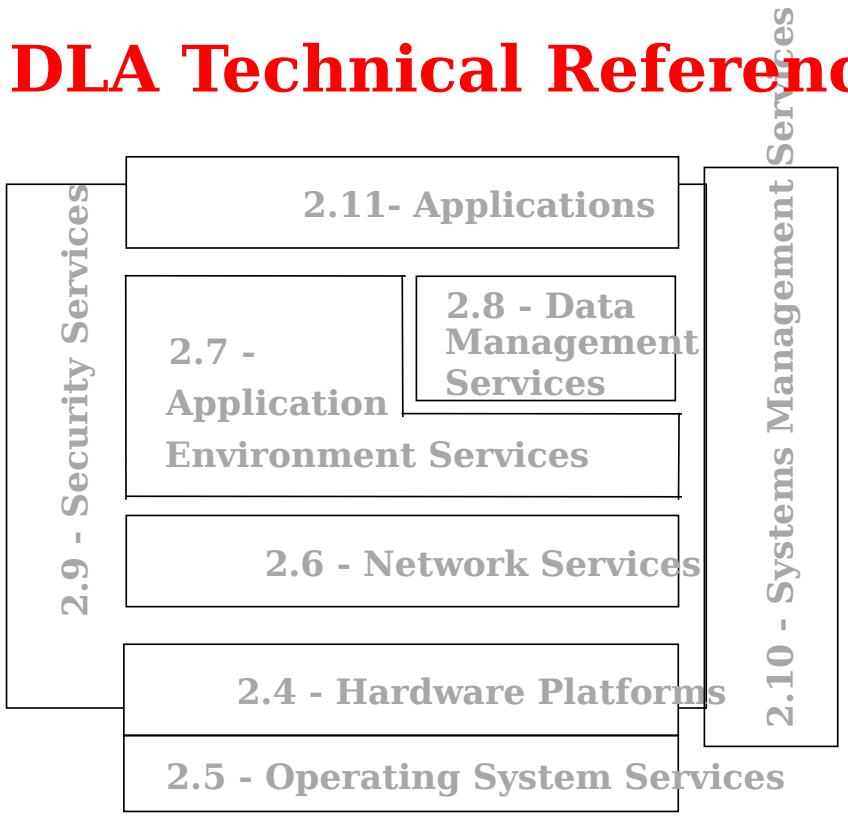
Enterprise Services

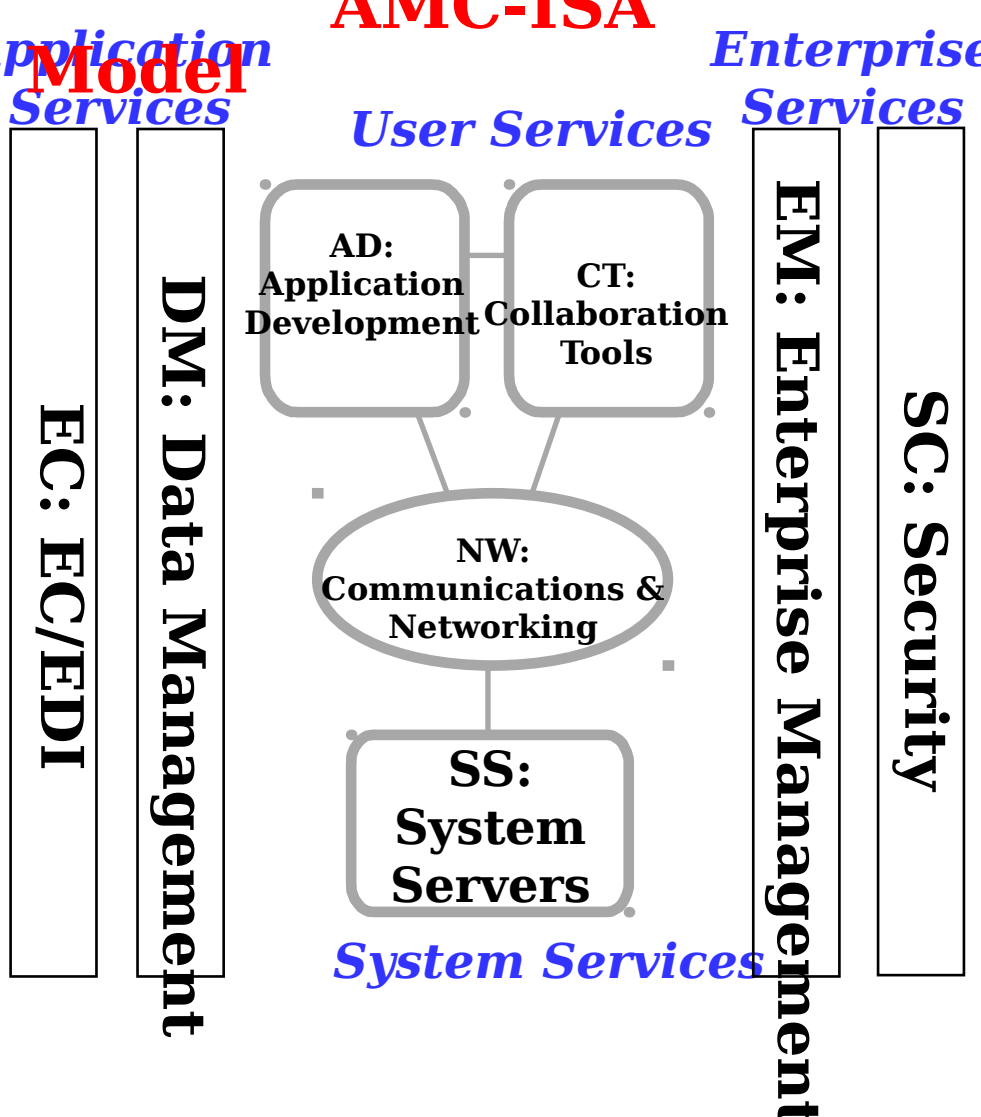
EM: Enterprise Management

SC: Security

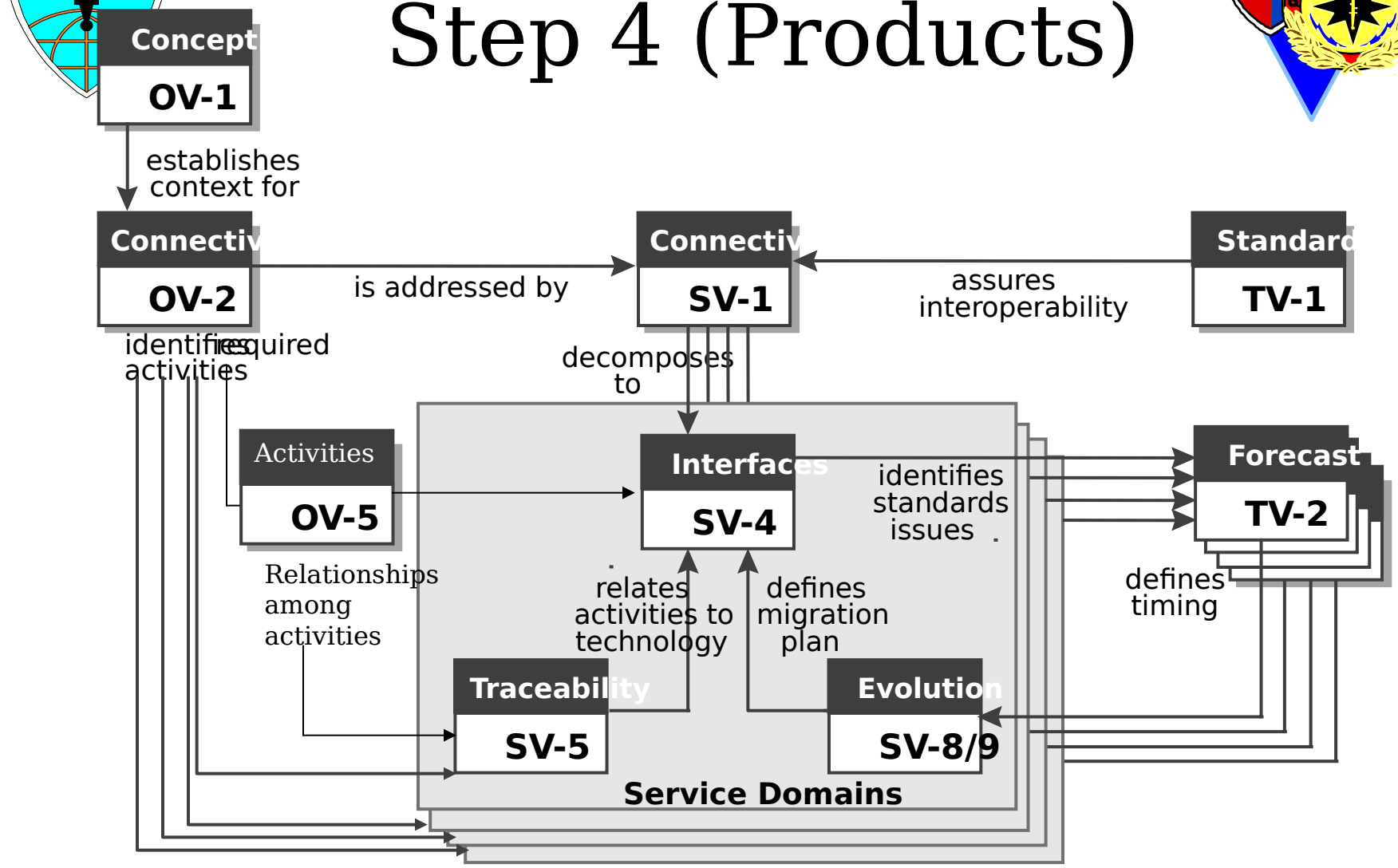
Characteristics

DLA and AMC Service Areas

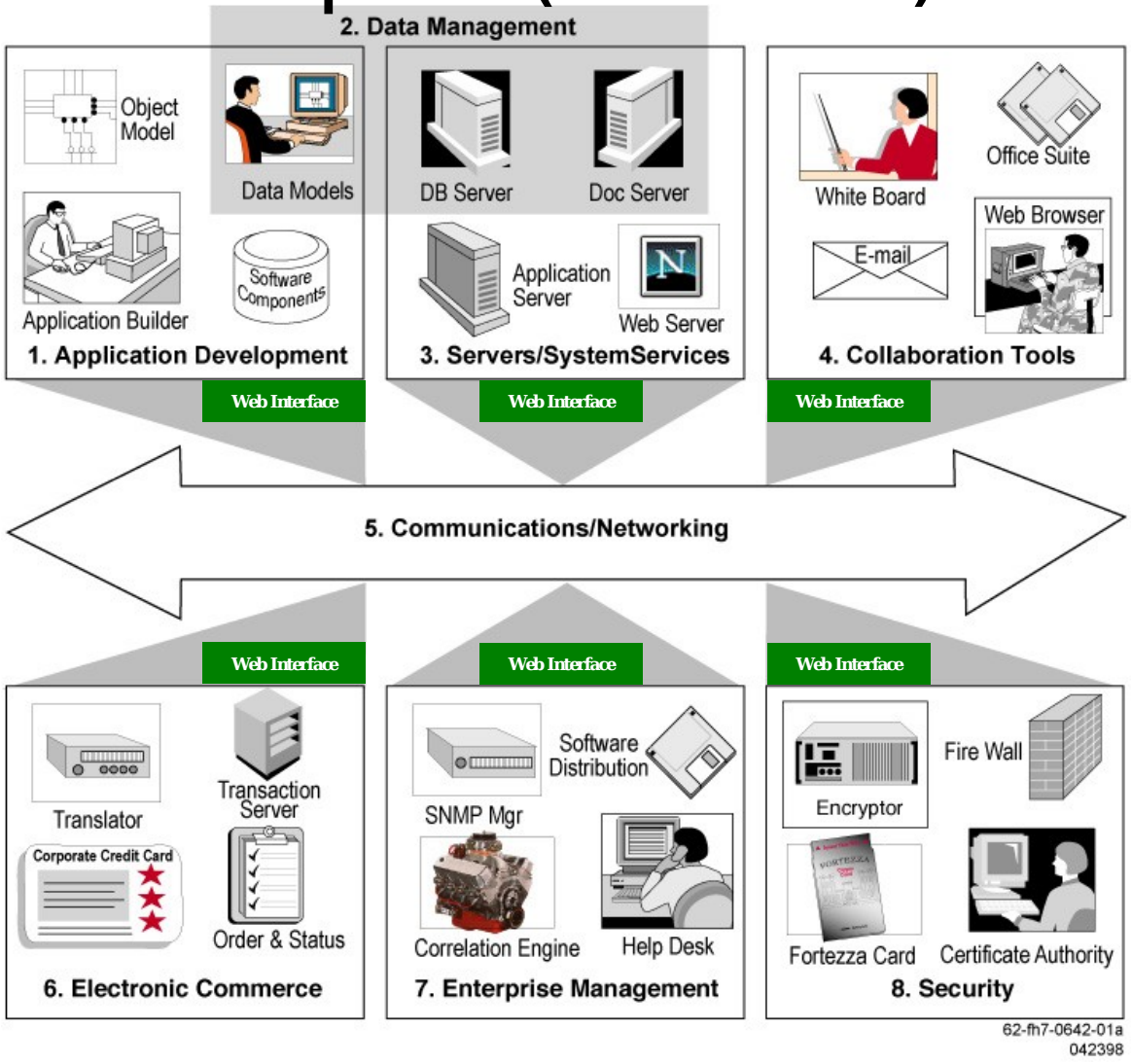

DLA Technical Reference Model
2.11- Applications
2.8 - Data Management Services
2.7 - Application Environment Services
2.6 - Network Services
2.4 - Hardware Platforms
2.5 - Operating System Services
2.9 - Security Services
2.10 - Systems Management Services



Step 4 (Products)



Step 5 (Build IT)

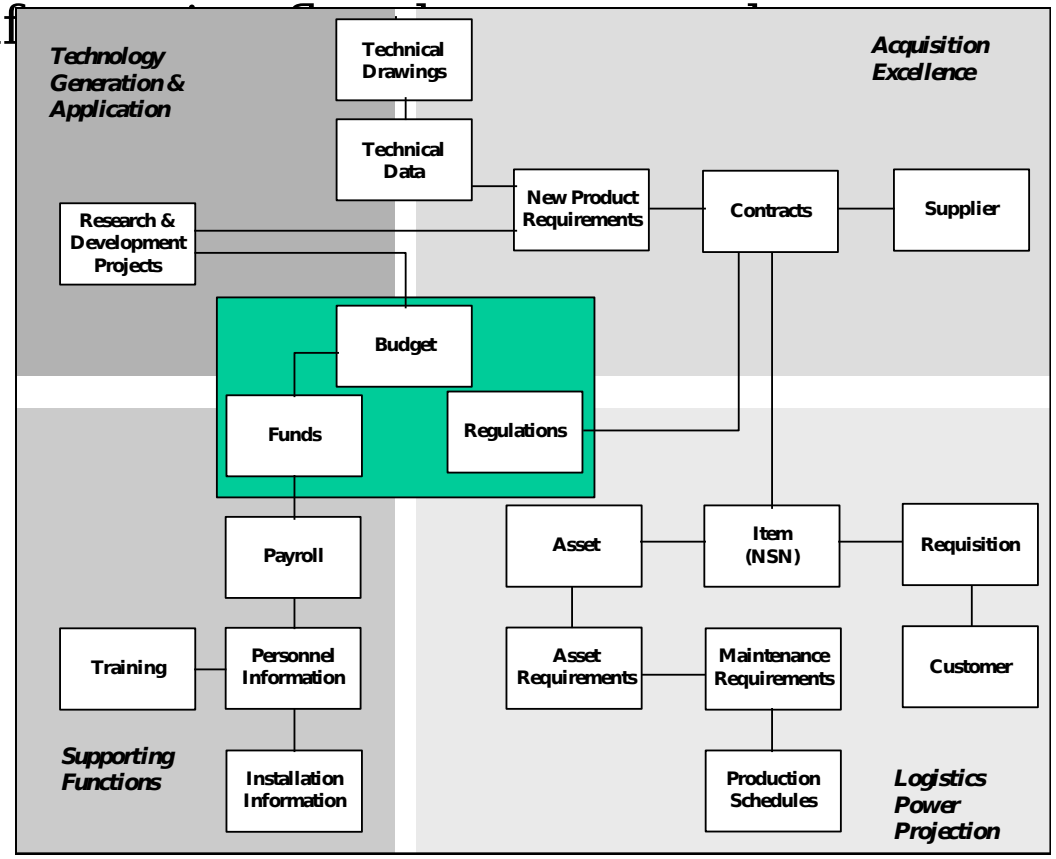


OV-1: High-Level Operational Concept Graphic

High-Level graphical description of operational concept (high level organizations, missions, etc.)

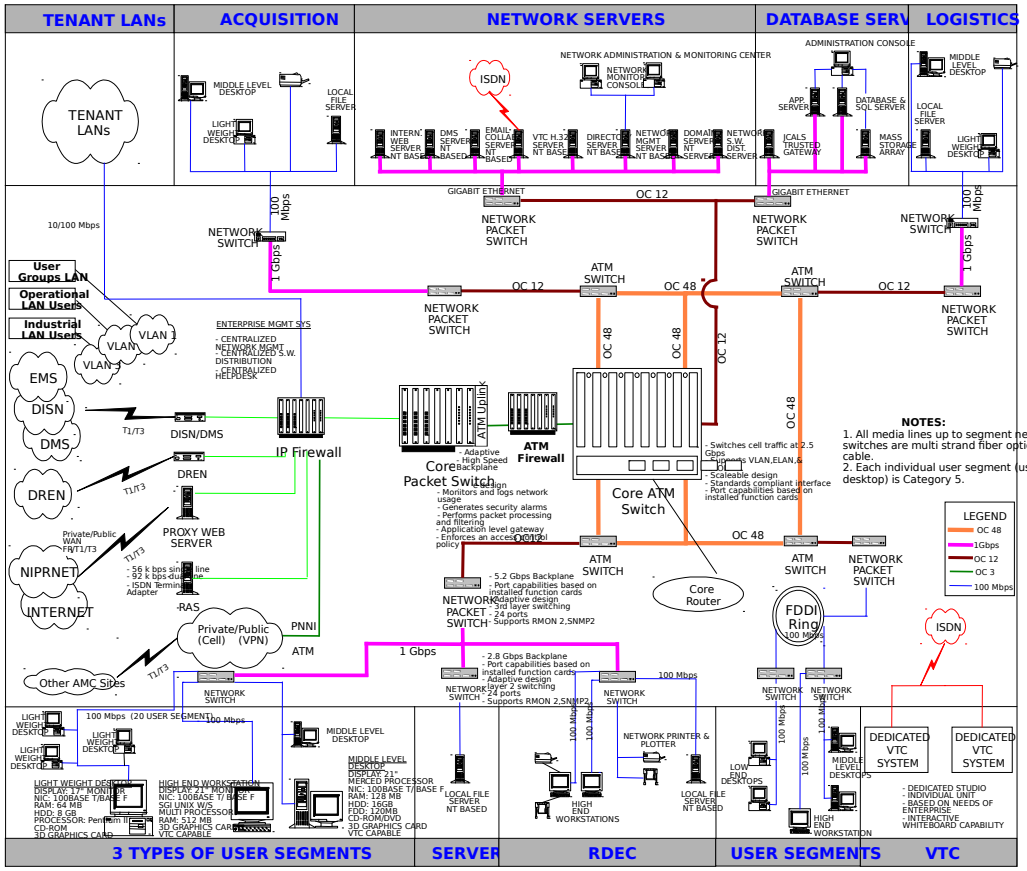
OV-2: Operational Node Connectivity Description

Operational nodes, activities performed at each node, connectivities, &



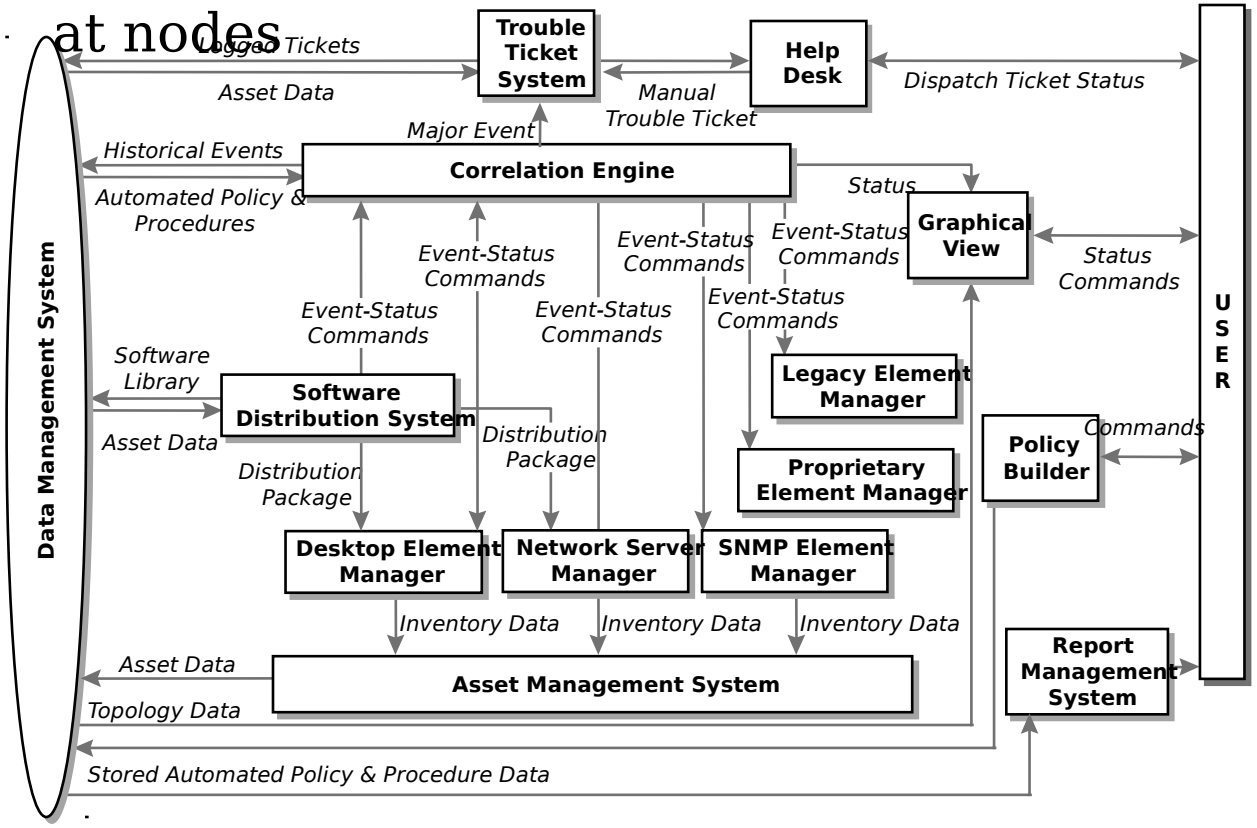
SV-1: System Node Connectivity

Physical nodes & connectivities, systems at nodes, and communications within nodes that provide the connectivity.



EM: SV-4 System Functionality

System functions, flow of data among functions, and relationships between systems or system functions and activities at nodes



EM: TV-1 Technical Architecture Profile

Extraction of standards and emerging standards

Enterprise Management	Management stations and management agents (in end systems and networked elements) shall support the Simple Network Management Protocol (SNMP). The following SNMP-related standard is mandated: ▪ IAB Standard 15/RFC-1157, Simple Network Management Protocol (SNMP), May 1990. To standardize the management scope and view of end systems and networks, the following standards for MIB modules of the management information base are mandated: ▪ IAB Standard 16/ /RFC-1212, Structure of Management Information, May 1990. ▪ IAB Standard 17/RFC-1155/RFC-1213, Management Information Base, March 1991. ▪ RFC-1514, Host Resources MIB, September 1993. ▪ STD-50/RFC-1643, Definitions of Managed Objects for the Ethernet-Like Interface Types, July 1994. ▪ RFC-1757, Remote Network Monitoring Management Information Base, (RMON Version 1), February 1995. ▪ RFC-1850, Open Shortest Path First (OSPF), Version 2 Management Information Base, November 1995. ▪ ANSI T1.204, OAM&P—Lower Layer Protocols for TMN Interfaces Between Operations Systems and Network Elements, 1993. ▪ ANSI T1.208, OAM&P—Upper Layer Protocols for TMN Interfaces Between Operations Systems and Network Elements, 1993. ▪ ITU-T M.3207.1, TMN Management Service: Maintenance Aspects of B-ISDN Management, 1996. ▪ ITU-T M.3211.1, TMN Management Service: Fault and Performance Management of the ISDN Access, 1996. ▪ ITU-T M.3400, TMN Management Functions, 1992. ▪ ISO/IEC 9595 Information Technology—Open Systems Interconnection Common Management Information Services, December 1991. ▪ ISO/IEC 9596-1:1991, Information Technology—Open Systems Interconnection—Common Management Information Protocol (CMIP)—Part 1: Specification. ▪ ISO/IEC 9596-2:1993 Information Technology—Open Systems Interconnection—Common Management Information Protocol: Protocol Implementation Conformance Statement (PICS) Proforma. ▪ RFC-1305, Network Time Protocol (V3), 9 April 1992.

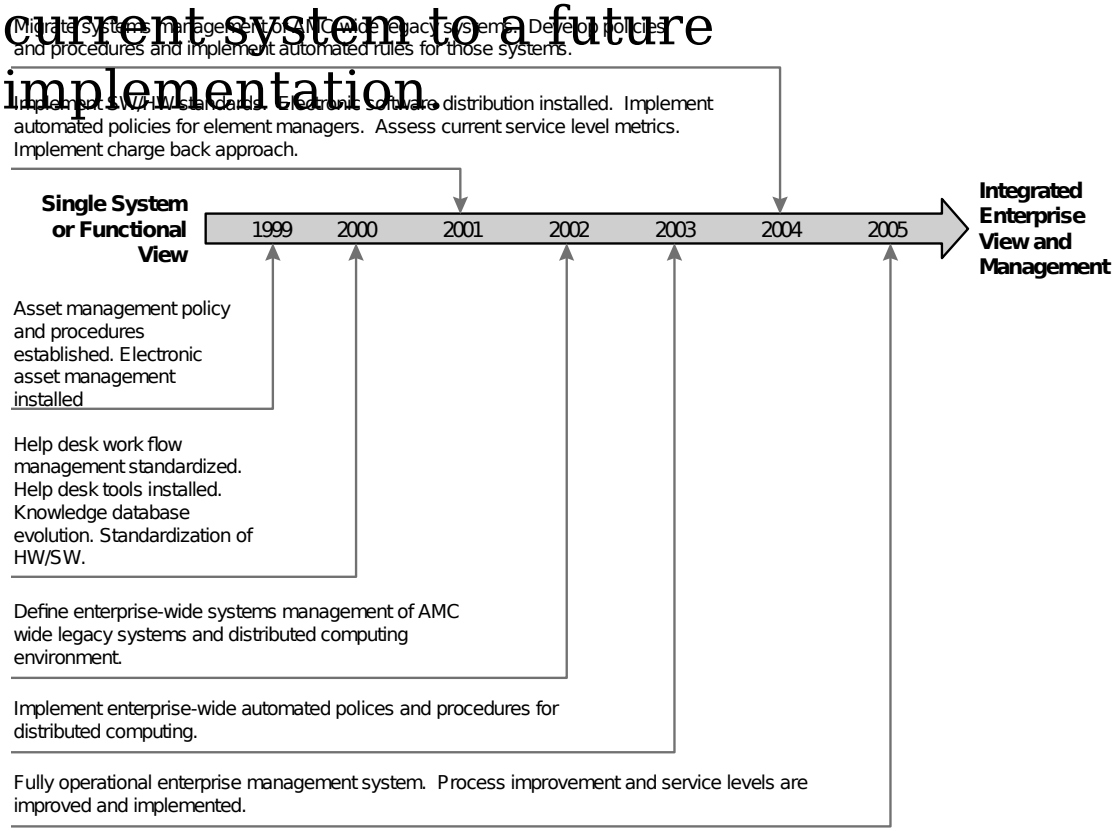
EM: SV-5 Function Traceability

Mapping of system functions back to operational activities.

SYSTEM FUNCTIONS	OPERATIONAL ACTIVITIES: Logistics											OPERATIONAL ACTIVITIES: Technology Generation					
	Process Requisitions	Manage Stock Orders	Process Stock Returns	Order and Receive Stock	Ship Stock	Manage Stock Maintenance	Process Receipts	Maintain Equipment Records	Move Assets	Dispose of Assets	Process Physical Inventory	Advise Technology Policy	Develop Standard Technology	Develop Standard Profiles	Manage Standards Activities	Manage Interim Measures	Develop Technology Plan
X.500 Directory					●								●	●	●		
X.400 E-Mail Engine	●	●	●				●						●	●	●	●	
Message Store	●	●	●				●	●	●				●	●	●	●	
Shared Folders	●	●	●				●	●	●				●	●	●	●	
Discussion Database	●						●	●					●	●	●	●	
Calendar													●	●	●	●	
Group Scheduler													●	●	●	●	
Task Manager	●	●	●										●	●	●	●	
Multipoint Controller													●		●	●	●
Multipoint Processor													●		●	●	●
Address Translator													●		●	●	●
Admissions Controller													●		●	●	●
Bandwidth Controller													●		●	●	●
Zone Manager													●		●	●	●
Gateway													●		●	●	●
Workflow Manager	●	●	●										●		●	●	●
CTI Platform	●	●	●										●	●	●	●	

EM: SV-8 System Evolution

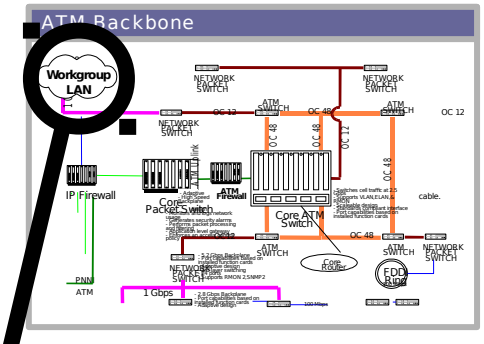
Planned incremental steps toward migrating a suite of systems to a more efficient suite or toward evolving a current system to a future implementation

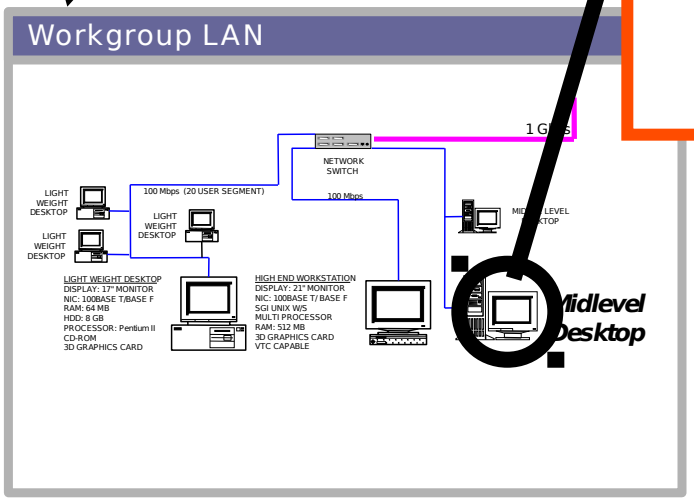

Migrate Systems Management of AMC wide legacy systems. Develop policies and procedures and implement automated rules for those systems.
Implement SW/HW standards. Electronic software distribution installed. Implement automated policies for element managers. Assess current service level metrics. Implement charge back approach.
Single System or Functional View
1999
2000
2001
2002
2003
2004
2005
Integrated Enterprise View and Management
Asset management policy and procedures established. Electronic asset management installed
Help desk work flow management standardized. Help desk tools installed. Knowledge database evolution. Standardization of HW/SW.
Define enterprise-wide systems management of AMC wide legacy systems and distributed computing environment.
Implement enterprise-wide automated polices and procedures for distributed computing.
Fully operational enterprise management system. Process improvement and service levels are improved and implemented.

SV-9 Technology Forecast

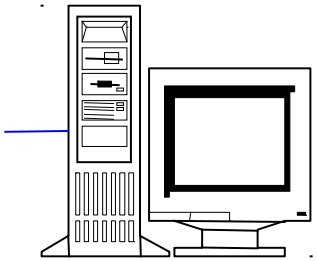
Technology Areas and Capabilities / Forecast of Industry Developments	Short-term (1998-2000)	Mid-term (2001-2002)	Long-term (2003 and Beyond)
Lightweight desktop	Integrated CPU Network computer	Thin client	Centralized administration and maintenance
Mid-level desktop	300-500MHz CPU 64 MB RAM/6-GB HDD AGP video	600 MHz-1GHz CPU 128 MB RAM/10-GB HDD 3d video	GHz-class CPU 256 MB RAM/ 14-GB HDD Integrated VTC
Workstation	SUN UltraSPARC (300500MHz) DEC Alpha (533 MHz) IBM RS/6000 (250 MHz) HP PA-RISC (250 MHz)	SUN UltraSPARC (600+MHz CPU) DEC Alpha (1GHz) IBM RS/6000 (500 MHz)	SUN UltraSPARC (GHz+ CPU) DEC Alpha (1.8GHz) IBM RS/6000 (1GHz)
Messaging	X.400 POP3/IMAP4 X.500/LDAP	X.400 POP3/IMAP4 X.500/LDAP	Multimedia messaging
Groupware	Messaging Workflow Internet collaboration	Internet messaging Workflow Internet collaboration	Internet messaging Internet workflow Internet collaboration
Whiteboard	Data only whiteboard and application sharing	T.120 standards-compliant whiteboard and application sharing	T.130-compliant multimedia whiteboard and application sharing
VTC	ISDN-based IP-based	ISDN-based IP-based POTS-based	ISDN-based IP-based POTS-based
CTI	Vendor API(TSAPI, TAPI) Proprietary platform (SCSA, MVIP)	Vendor API(TSAPI, TAPI) Java API Proprietary platform (SCSA, MVIP) Standards-based platform (ECTF)	Use of speech recognition Integration with Web

NETVIZ Presentation Tool





Midlevel Desktop



DISPLAY: 21"
MERCED PROCESSOR
NIC: 100BASE T/ BASE F
RAM: 128 MB
HDD: 16GB
FDD: 120MB
CD-ROM/DVD
3D GRAPHICS CARD
VTC CAPABLE

AMC Common Operating Environment (COE)

- AMC COE takes the ISA to a more specific level
- Establishes specific technology selection criteria
  - Interoperability
  - Standards
  - Laws, Mandates and Policy
- Specifies strategic and common components (recommended use)
  - Central control over minimum essential set of components to achieve AMC IT goals
  - Maximum flexibility to Commands
- Further development through the AMC

AMC COE

Collaborative Tools Service Area

Component category	Component
Strategic	Integrated Server Suite
	Workstation/Network Operating System
	Electronic Mail Server
	Office Automation Suite
	Web browser
	Workflow Manager
Common	Workflow ManagerHigh Performance Workstation (SPARC/UNIX-based)
	High Performance Workstation (SPARC/UNIX-based)High Performance Workstation (PC/Intel-based)
	High Performance Workstation (PC/Intel-based)Lightweight Desktop Computer
	Lightweight Desktop ComputerMid level desktop computer
	Mid level desktop computerNotebook Computer
	Notebook ComputerDesktop VTC, single point/multi-point
	Desktop VTC, single point/multi-pointMulti-point VTC Server
	Multi-point VTC ServerPortable Projection Device
	Portable Projection DeviceForms software, PC-based
	Forms software, PC-based Web Authoring Tool
	Web Authoring Tool

AMC COE

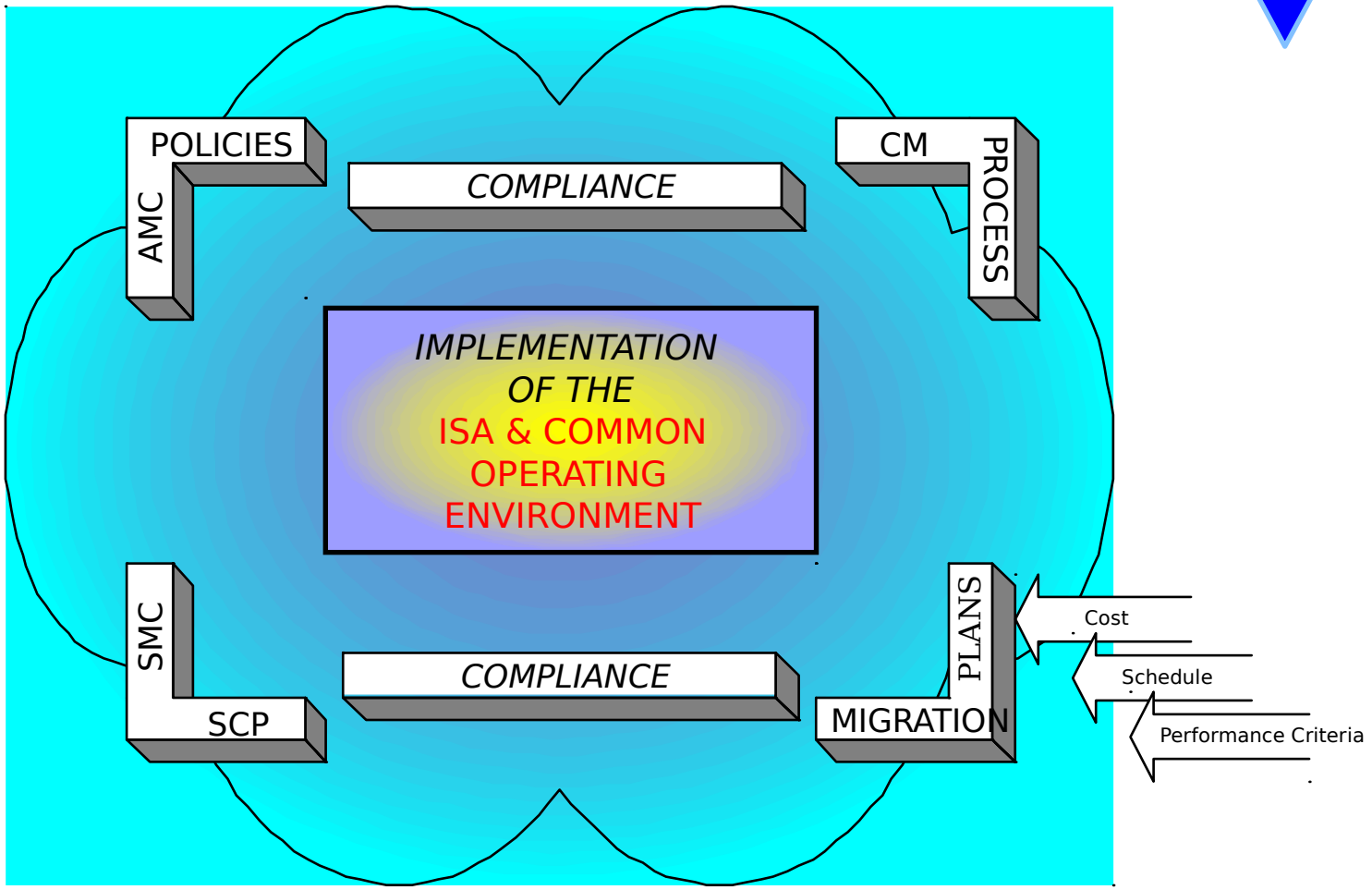
Component	Recommended Prod	DII COE	ITA-A
Integrated Server Suite		NL	NA
Workstation/Network Operating System		Y	Y
Electronic Mail Server		Y	Y
Office Automation Suite		Y	Y
Web browser		Y	Y
Workflow Manager	JCALS (WFM)	Y	NA
High Performance Workstation (SPARC/UNIX-based)		NA	NA
High Performance Workstation (PC/Intel-based)	Intel Pentium Class 500	NA	NA
Lightweight Desktop Computer	Intel Pentium Class 400	NA	NA
Mid level desktop computer	Intel Pentium Class 450	NA	NA
Notebook Computer	Intel Pentium Class 300	NA	NA
Desktop VTC, single point/multi-point		NL	Y
Multi-point VTC Server		NL	Y
Portable Projection Device		NA	NA
Forms software, PC-based		NA	NA
Web Authoring Tool		Y	Y

Y = Yes, NA = Not Applicable, NL = Not Listed

AMC COE

Select	Watch	Reassess
Policies and Plans		
Requirements analysis Security policy Implementation Plan Training policy Distribution plan	Present and emerging industry practices Existing and Emerging DoD and Govt implementations of e-mail and desktop applications	
Technologies and Functionalities		
End to end security Scalability Centrally managed directory Standards-based applications and tools Open architecture support Web-based interfaces JAVA for Web development XML for Web development	JINI	Proprietary applications and interfaces
Standards and Specifications		
E-mail – SMTP, IMAP, POP EDI- ANSI X.12, Central Directory Management (LDAP) Security (SSL, X.509, HTTP/S, S-MIME)		Closed applications and systems

Step 6 (USE IT)


POLICIES
AMC
COMPLIANCE
CM
PROCESS
IMPLEMENTATION
OF THE
ISA & COMMON
OPERATING
ENVIRONMENT
SMC
SCP
COMPLIANCE
PLANS
MIGRATION
Cost
Schedule
Performance Criteria

Lessons Learned

- Framework products are a way to view the architecture. They should not be considered the architecture itself.
- Do the planning (6 Step Process) - The questions that the architecture is being built to answer must be clear and specific
- Set clearly defined Objectives and realistic timelines
- Have transition strategy for implementation ready (funding, organization, migration plan)
- Make sure the cultural and political environments are ready
- Support your local DOIMs

Lessons Learned

- C4ISR (DOD) Framework not universally used, understood or accepted
- MACOM Level Architecture was breaking new ground
- Architecture Tools are not matured or standardized
- Different Stakeholders have different expectations
- “If you build it, they will come” not always the case (constant coordination a must)

References

1. Systems Architecting- Creating & Building Complex Systems, 1991, Eberhardt Rechtin, Prentice Hall
2. The Art of Systems Architecting, Mark W. Maier, Eberhardt Rechtin, 2nd ed., 2000, CRC Press
3. Systems Architecting of Organizations- Why Eagles Can't Swim, Eberhardt Rechtin, 2000, CRC Press
4. Course Notes AE549a – Systems Architecting, Winter/Spring Semester 2002,Elliot Axelband
5. Course Notes AFCEA 503- C4ISR Architecture Framework Implementation, Alexander H. Levis, September 2000
6. Systems Engineering Management, Achieving Total Quality, 1994, James A. Lacy